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(54) MEAT PROCESSING METHOD AND APPARATUS

(71) We, ITT INDUSTRIES INC., a Corporation organised and existing under the Laws of the State of Delaware, United States of America, of 320 Park Avenue, New York 22, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to the processing of meat to reduce microbial counts on raw meat pieces. More particularly, the invention relates to a process for substantially reducing the microbial content of raw pork for use in the manufacture of pork sausage.

Pork sausage has been sold for many years as a fresh meat product which is well cooked before it is consumed. Recent developments in the packaging, distribution and sale of raw pork sausage make a longer storage life necessary. Bacteriological guidelines are now being established for fresh ground pork and beef products which are difficult to achieve without improvement in conventional meat operations.

Except for whole hog sausage, many different cuts and trimmings of pork are utilized in making pork sausage. These different cuts and trimmings come from different anatomical locations and differ widely in size, fat and lean content and in the degree of microbial contamination. The microbial contamination of most concern is the surface contamination that is acquired during processing. One attempt to reduce the microbial content of the meat trimmings is disclosed in U.S. Patent No. 3,705,813: however, the treatment to reduce bacteria counts effectively in long-life fresh pork sausage made on a continuous production basis in conventional meat packing plants is more severe and critical than was believed necessary or taught in that patent.

After improving the sanitation of all aspects of meat plant operations, for example, washing carcasses with hot chlorinated water to decontaminate the skin surface; using quick-chill tunnels to avoid condensation and shorten the time required to chill carcasses effectively; and using advanced cleaning and sanitizing techniques for conveyors and other equipment, it was discovered that microbial counts can be effectively reduced on fresh meat cuts by treating the meat with superheated steam in order to produce meat products which have a substantially lower bacteria content and improved storage life.

Bacteriological analysis has demonstrated that the major source of contamination is on the meat surface which provides an ideal enviroment and nutrients for bacterial growth, since the interior portion of the meat is usually sterile. A variety of differently sized and shaped pork trimmings and cuts is normally used in the manufacture of fresh pork sausage, and the large area of raw meat surface involved can result in high bacteria counts in the finished product which results in a limited shelf life. The destructive effect of high temperature on bacteria is known together with associated denaturation or coagulation of meat proteins.

Therefore, the critical use of temperature and time of a super-heated steam treatment is necessary to destroy bacteria without excessive heat denaturation of the meat surfaces. It has been discovered that to successfully reduce the microbial counts, it is necessary to use a rapidly circulating super-heated steam atmosphere with turbulent flow to ensure rapid and thorough contact with all the meat surfaces. The time, temperature, steam velocity and means required effectively to reduce bacteria on raw meat cuts and the production of pork sausage using steam treated meat is the subject of this invention.

According to one aspect of the present invention there is provided a method of treating the exterior surfaces of fresh meat pieces to reduce microbial counts and improve the storage life

of a fresh meat product produced from the pieces, comprising exposing the exterior surfaces of said pieces to a super-heated steam atmosphere at 240°F to 320°F. for 40 to 80 seconds.

According to a further aspect of the present invention there is provided apparatus for treating the exterior surfaces of fresh meat pieces, whereby to reduce microbial counts and improve the storage life of fresh meat products produced from the pieces comprising means constituting a tunnel for treatment of meat pieces in a super-heated steam circulating atmosphere at a temperature between 400°F and 320°F; and conveying means in said tunnel for conveying said pieces through said tunnel in a time between 40 and 80 seconds and disturbing the conveyed pieces whereby to expose all exterior surfaces of said meat pieces to said steam.

Figure 1A and 1B illustrate a meat processing unit and figure 2 is a flow diagram illustrating one method for manufacturing fresh pork sausage.

Figures 1A and 1B show a meat processing unit. Figure 1A is a partial isometric view of the unit, and Figure 1B is a partial schematic view of the unit. In general, the tunnel portion consists of a stainless steel tubular housing in which is mounted a driven stainless steel wire belt conveyor arrangement. The outside wall of the tunnel is separately heated, and trap doors are mounted on the inlet and exit ports of the tunnel so that the treatment of the meat occurs in substantially a total steam atmosphere. Variously-sized pieces of meat can be treated with super-heated steam at temperatures from 240°F. to 320°F. for the desired period of time. The meat processing unit is designed to be easily disassembled for washing and sanitizing all parts of the system which come into contact with meat surfaces.

Referring to the figures, the meat processing unit in a specific example includes a six-feet long stainless steel processing tunnel 11 with about a twelve inch inside diameter. On the outside of tunnel 11, a number of 1,000 watt strip heaters 12 are mounted to insure that the inside wall 13 of the tunnel is kept at a temperature about 30°F. higher than the circulating steam to prevent moisture condensation. The heaters and tunnel are covered with a high temperature insulation and surrounded by outer shell 10. Other means could be utilized in place of the electrical heaters shown; for example, they could be replaced by a high temperature steam jacket which is fed by a separate steam source to maintain the higher temperature on the wall 11 of the tunnel. A high temperature blower 14 circulates the steam in the direction of arrows 15. The blower is capable of circulating the steam at a linear velocity of 100 to 1500 feet per minute through duct 16, 6 kW electric duct heater 17, ducts 18, tunnel 11, and return duct 19. The circulating steam can be super-heated or maintained super-heated by heater 17 before it enters the tunnel. The inside steam temperature 20 of the tunnel 11 is controllable from 240°F. to 320°F.

Inside the tunnel, a pair of looped, stainless-steel, wire-belt conveyors 21, 22 are rotatable and removably mounted about shafts 21*a*,*b* and 22*a*,*b*. The belts are driven from shafts 21*a*, 22*a*, extending through the wall of end ports 26, 30, and the belts are removable from the tunnel for cleaning and sanitizing. The belts may be separately or jointly driven in the continuous loop by geared motor speed drives which are controllable by SCR control units in a known manner. The belts are controlled so that the total travel time of the meat through the tunnel may be varied at least between 40 to 80 seconds. At a point in the tunnel, the meat being treated is dropped from conveyor 21 onto conveyor 22, this disturbs the pattern of the meat on the belts so that no surface escapes treatment and exposure to the super-heated steam during transit through the tunnel.

In operation, the tunnel wall 13 is preheated to a temperature of about 30°F. above the steam temperature and the system is flooded with steam from steam input line 24 to purge the air from the tunnel, and the recirculating blower 14 is then turned on. The steam flow (volume rate) is set between 5 to 20 cubic feet per second, equivalent linear velocity of 400 to 1200 feet per minute, and preferably to about 10 cubic feet per second (700 feet per minute) and the system is left on for at least 10 minutes to stabilize, so that the meat trimmings are treated in substantially a total steam atmosphere. This process also kills any trace of micro-organisms that might be left after cleaning of the equipment.

The pork cuts and trimmings are dropped forward of drop guide 23 onto conveyor 21 through a trap door 27 in the entrance trough 28. The door 27 is counterbalanced to keep it in a normally closed position to minimize steam escape through the door opening. Similarly, an exit trap door 29 is located in the exit port 30 at the discharge end of the processing unit.

To achieve uniform treatment, the trimmings and cuts are treated for a time on the first conveyor 21 and then the pattern disturbed by dropping the pieces onto the second conveyor 22. The treated meat is collected at the opening 31, after passage through the tunnel. This steam treatment begins as soon as the trimmings and cuts are dropped through the trap door 27 onto the belt 21, so that the meat is treated in substantially a total steam atmosphere.

A variety of different kinds of pork trimmings and cuts used for the manufacture of the fresh pork sausage were evaluated. These trimmings and cuts are derived from different anatomical locations and vary considerably in size, shape, lean content, and degree of surface

contamination. Therefore, it was considered essential to investigate each type of trimming and cut from the standpoint of the minimum steam treatment conditions necessary to effectively reduce bacteria counts. The meat used for steam processing studies and pork sausage examples are maintained at about 32°F. to 38°F. In commercial operation the starting temperatures of different trimmings and cuts could vary depending on their source being from freshly slaughtered carcasses or chilled trimmings and cuts. All equipment, including the meat processing unit, was thoroughly washed, sanitized and rinsed with clean water to avoid chance contamination of the meat surface. The meat processing unit was started, the super-heated steam flow rate, temperature and conveyor speed adjusted for the desired product dwell-time. The unit was allowed to settle down to the desired temperature for about ten minutes before adding the meat. The meat processing unit was operated with super-heated steam at the preferred flow (volume) rate of about 10 cubic feet per second, and the total steam atmosphere was circulated at the preferred linear velocity of about 700 ft./min. flowing in the same direction as the travel of the meat. The pork trimmings to be tested were cut to a suitable size, for example, 2" x 3" x 5" or smaller for adding to the steam processing unit. The meat was fed into the unit at a rate of approximately 3 lbs/min. to 5 lbs./min. depending upon the size of the meat pieces with sufficient spacing between the pieces to permit all meat surfaces to be exposed to steam. The meat was collected in polyethylene bags at the discharge part of the steam tunnel, about 5 to 10 lbs. per bag, and rapidly chilled in a blast freezer to remove the surface heat. The pieces can be chilled to about 28°F. to 50°F. The chilled meat was then ground and submitted to bacteriological analysis.

The initial bacterial counts, with respect to total aerobic plate count (A.P.C.), coliform and E. coli bacteria, varied considerably with the type of trimmings used. On these tests, boneless picnics and belly strips had the highest counts, and shoulder trimmings and boneless butts the lowest. Although the initial total bacteria plate counts were usually within acceptable limits, the initial coliform and E. coli bacteria counts often exceeded preferred target standards for fresh pork sausage of less than 1,000 coliform and less than 100 E. coli per gram. The apparatus and method was evaluated at steam temperatures ranging from 215°F. to 340°F. and dwell times ranging from 15 to 80 seconds.

The meat surfaces were not treated adequately and there was moisture condensation on the meat when the unit was operated with steam temperature below 240°F. The maximum steam temperature which could be used without excessive treatment and fat melting was 320°F. Dwell times of less than 40 seconds resulted in very uneven treatment, regardless of the temperature used, and the preferred, most uniform results were obtained using about 60 seconds. No practical advantages were obtained with dwell times in excess of 80 seconds. With this meat processing unit and method of treatment, only a very thin outer layer of the meat surface, approximately 1 mm in depth, was modified by the heat treatment. This was determined by the colour of cross-sectional cut slices which showed only a very thin layer of brown denatured myoglobin pigment on the surface, with about 99% of the meat unmodified and its internal temperature still cold at about 36°F. to 42°F.

Different super-heated steam temperatures were particularly used from 240°F. to 320°F., for the preferred approximate 60 seconds dwell time in the unit. Excellent and preferred results were obtained at 280°F. as shown in Table I.

TABLE I

Effect of treatment with 280°F. steam for 60 seconds on
Reduction of Bacteria counts of Different Pork Trimmings

Type of Pork Trimming	Bacteria Counts					
	Initial			After 280°F. Steam Treatment		
	A.P.C.	Coliform	E. Coli	A.P.C.	Coliform	E. coli
Boneless Picnics	820,000	1,100	93	62,000	23	3
Belly Strips	131,000	110,000	4,600	3,500	150	20
Small Blade Trim.	78,000	93	23	2,000	23	3
Belly Flank Trim.	23,800	460	460	300	9	9
Shoulder Plate Trim.	20,800	150	93	11,400	9	9
Fat Back Trim.	15,400	460	240	200	3	3
Shoulder Trim.	11,000	9	9	1,000	3	3
Boneless Butts	7,400	460	43	200	3	3

Target Standards for Pork Sausage:

Total aerobic bacteria plate count	– less than	10,000,000 per gram
Coliform bacteria	– less than	1,000 per gram
Escherichia coli	– less than	100 per gram

As can be seen from Table I, the total bacteria plate counts were reduced significantly, and the coliform and E. coli counts were reduced to well within the required guidelines for fresh pork sausage even though starting counts were quite high.

These results demonstrated that the super-heated steam treatment of the meat in the unit is an effective method to substantially reduce the bacteria count thereof. The reduction in coliform and E. coli is of even greater practical significance since the super-heated steam treatments used were most effective in reducing these bacteria.

Pork Sausage Examples

Pilot tests were conducted to determine the processing conditions necessary to produce fresh pork sausage with the substantially reduced microbial counts, using meat treated with super-heated steam. The microbial counts meet the required guidelines established and do not exceed these standards during the normal shelf life of the product. Also important is that the process must maintain or improve the acceptability of the fresh pork sausage for the extended storage life.

The pork trimmings and cuts selected were shoulder trimmings, belly shoulder and belly strips, as being representative types, i.e. shoulder trim is relatively low to medium, and belly strips medium to higher levels of surface contamination. A processing time of about 60 seconds was selected as most preferred from the standpoint of uniformity of surface treatment. Steam temperatures of 250°F., 280°F. and 320°F were then examined. At the preferred 60 second treatment, a temperature of 250°F was about the minimum temperature with which one could expect effective results, 280°F. the preferred temperature and 320°F. the maximum which could be used without excessive change in fresh meat colour and texture. The resultant appearance of the fresh pork sausage must clearly indicate that it is a fresh raw product and not cooked. The effect of antioxidants on the flavour stability of roll or chub packed sausage and the effects of pasteurization on the colour of link sausage stuffed into Devro (Registered Trade Mark) collagen casings were also evaluated.

Figure 2 is a flow diagram which illustrates one process that may be used to prepare the fresh pork sausage. After all equipment was thoroughly cleaned and sanitized and the pasteurizer unit was allowed to settle down to the desired temperature, the following process was used:

(1) Cut cold refrigerated meat, about 32° to 38°F. into suitable sized pieces to feed into the steam processing unit. The maximum size piece was approximately 3 inches thick by 5 inches in length.

(2) Feed the pieces into the steam processing unit at a rate of about 5 lbs/min.

(3) Collect the treated meat, for example in polyethylene bags, place a freezer and chill to about 32°F. to 50°F.

(4) Grind through a 5/8" plate and scale off batch sizes of 40 lbs. of ground pork, using the required blend of lean and fat trimmings, to obtain the 48% to 50% fat in the finished product as required by the Formulas A and B.

(5) Add the ground pork and sausage seasoning to a meat mixer and blend for about 5 minutes.

(An alternate procedure to steps (4), (5) is chopping the pieces of meat with the seasoning and then feeding the blend to the grinder).

(6) Grind the meat blend through a 1/8" plate and stuff into casings for chub packed pork sausage, or into a Devro (Registered Trade Mark) casing for link sausage.

(7) Store pork sausage at 32°F. to 38°F.

Pork Sausage Formulas

Formula A *Pork Sausage, Chub Packed*

Pork Belly Strips	33 lb. 6 oz.
Pork Belly Shoulder Trim	6 lb. 10 oz.
Total Met Weight	40 lb.
Pork Sausage Seasoning*	13.9 oz.
Total Batch Weight	40 lb. 13.9 oz.

* *Seasoning Used for Formula A*

Ingredients: salt, sage, sugar, black pepper, red pepper

Seasoning prepared using:

(1) Regular Salt

(2) Morton R.G. 1.14 Dendritic (Antioxidant) Salt containing the following level of approved antioxidants:

Butylated Hydroxyanisole	0.253%
Butylated Hydroxytoluene	0.253%
Citric Acid	0.253%

Salt use level was 1.5 lb. per 100 lb. of meat

Formula B *Pork Sausage Links*

Pork Shoulder Trim, 50% Lean	50 lb.
Pork Sausage Seasoning**	1 lb. 8.5oz.
Total Batch Weight	51 lb. 8.5oz.

*** Seasoning Used for Formula B*

Ingredients: Salt, dextrose, spice extractives, monosodium glutamate 3.07%

Use level 3 lb. 1 oz. per 100 lb. meat

The fresh sausage produced by this process was analyzed for fat, salt, total aerobic bacteria, coliform bacteria and E. coli. The stored product was also analyzed for bacteria and evaluated by a flavour panel at weekly intervals. The results obtained on the pork sausage examples are shown in Table II to V. The results indicate that bacteria counts were reduced to well within the target standards and storage life was extended several weeks by the steam treatment.

The appearance, flavour and texture of cooked sausage were evaluated by a flavour panel, using a scoring system of 5 = excellent; 1 = unsatisfactory. Little difference was observed in appearance and texture, therefore, only the flavour scores are shown in the attached tables. The flavour scores obtained using steam treated meat were equal or better than the controls, and the storage life was extended by one to several weeks. Good flavour scores were obtained on sausage made using meat treated with 320°F. steam, but the colour of the raw sausage was dull and it tended to shrink more during cooking. Excellent results were obtained using meat processed at 270°F. Acceptable results were also obtained at 250°F. depending upon the initial count of the pork trimmings.

Flavour scores indicated that antioxidant seasoning is not required to protect the flavour of roll or chub sausage packaged in oxygen impermeable plastic casings.

TABLE II

Results on Pork Sausage (1). Prepared using Pork treated with 250°F. vs. 320°F. steam for 60 seconds vs. untreated control

Steam Temp. °F. for 60 seconds	No. Days Stored	Bacteria per gram A.P.C. (2)	Coliform (3)	E. coli (4)	Flavour Score
Control,	1	300,000	4,600	290	–
(Not treated)	8	480,000	1,500	1,100	4.1
	15	470,000	1,400	240	1.6
250°F.	1	21,000	240	15	–
	7	12,000	240	93	4.1
	14	113,000	93	93	3.8
	21	1,780,000	460	240	3.2
	28	23,200,000	460	240	3.0
	35	21,200,000	43	43	–
320°F.	1	28,000	150	3	–
	7	18,000	93	43	3.1
	14	231,000	23	9	3.5
	21	1,180,000	9	3	3.7
	28	5,200,000	3	3	3.0
	35	11,200,000	9	3	3.5

(1) Sausage was prepared using a blend of pork belly strips and belly shoulder trimmings, Sausage Formula A
(2) Total aerobic bacteria plate count per gm.
(3) Coliform bacteria per gm., 9 Tube MPN
(4) E. coli bacteria per gm., 9 Tube MPN

Chemical Analysis

Sample	*Fat %*	*Salt %*
Control x	48.0	1.70
250°F.	48.8	1.56
320°F.	47.7	1.58

TABLE III

Results on Pork Suasage (1) Prepared Using Pork Treated with 250°F. steam for 60 seconds with and without Antioxidants in Seasoning vs. Control Sample

Steam Temp. °F.	Antioxid. in Seasoning	No. Days Stored	Bacteria per gram A.P.C.	Coliform	E. Coli	Flavour Score
Control	None	2	217,000	2,400	93	4.1
"	"	8	119,000	1,500	460	3.9
"	"	15	1,420,000	2,400	2,400	3.4
"	"	22	13,000,000	4,600	4,600	2.9
250°F.	None	2	5,200	460	15	4.0
"	"	8	7,300	93	93	3.7
"	"	15	8,200	23	9	2.9
"	"	22	350,000	75	75	3.7
250°F.	Yes	2	13,000	460	21	4.3
"	"	8	11,200	240	93	3.9
"	"	15	55,000	240	240	3.4
"	"	22	10,800,000	460	460	3.0

(1) Samples prepared using a blend of pork belly strips and belly shoulder trim, Sausage Formula A containing regular salt or antioxidant salt.

Chemical Analysis

Sample	*Fat %*	*Salt %*
Control, No. antiox.	52.1	1.56
250°F., No. antiox.	49.2	1.50
250°F., Antiox.	47.0	1.56

TABLE IV

Results on Pork Sausage (1) Prepared using pork treated with 280°F. steam for 60 seconds v. control Sample

Steam Temp. °F.	No. of Days Stored	Bacteria per gram A.P.C.	Coliform	E. coli	Flavour Score
Control	8	42,000	2,400	2,400	3.2
"	15	43,000	1,100	1,100	2.3
280°F.	8	3,200	23	23	4.1
"	15	4,000	23	23	4.3

(1) Samples were prepared using a blend of pork belly strips and belly shoulder trim Sausage Formula A

Chemical Analysis

Sample	*Fat %*	*Salt %*
Control	43.5	1.71
280°F.	45.0	1.60

TABLE V

Results on Link Pork Sausage (1) Prepared Using Pork treated with 280°F. steam for 60 seconds vs. Control

Steam Temp., °F.	No. of Days Stored	A.P.C.	Bacteria per gram Coliform	E. coli	Colour Eval.	Flavour Score
Control	2	64,000	240	240	Fresh bright pink	3.5
"	8	58,000	460	240	Some colour fading sl. pink	3.0
280°F.	2	2,800	9	9	Pink not as bright as control	3.62
"	8	3,200	43	43	Sl. pink not as good as control	4.5

(1) Samples prepared using pork shoulder trimmings Sausage Formula B stuffed into Devro (Registered Trade Mark) Casings.

Chemical Analysis

Sample	*Fat %*	*Salt %*
Control	45.0	1.50
280°F.	46.0	1.52

Accordingly, it has been shown that the method of treating meat with super-heated steam substantially reduces bacteria counts of raw pork. The quality and shelf life of fresh pork sausage can be improved by the use of this method, and bacteria counts can be reduced to well within the established requirements.

WHAT WE CLAIM IS:

1. A method of treating the exterior surfaces of fresh meat pieces to reduce microbial counts and improve the storage life of a fresh meat product produced from the pieces, comprising exposing the exterior surfaces of said pieces to a super-heated steam atmosphere at 240° F to 320°F. for 40 to 80 seconds.

2. A method as claimed in claim 1, wherein the pieces are conveyed through a substantially full tunnel of super-heated steam having a temperature of 240°F. to 320°F. for 40 to 80 seconds; and wherein pieces are disturbed during passage through the tunnel whereby to expose all exterior surfaces of the pieces to said steam.

3. A method as claimed in claim 2, wherein the interior wall of said tunnel is maintained at about 30°F. higher than the said steam temperature.

4. A method as claimed in claim 2 or 3, wherein the super-heated steam is circulated through said tunnel at a linear velocity of 400 to 1200 feet per minute.

5. A method as claimed in any one of the preceding claims wherein the meat is pork and the fresh meat product is a fresh sausage or similar type product.

6. Apparatus for treating the exterior surfaces of fresh meat pieces, whereby to reduce microbial counts and improve the storage life of fresh meat products produced from the pieces comprising means constituting a tunnel for treatment of meat pieces in a super-heated steam circulating atmosphere at a temperature between 240°F and 320°F and conveying means in said tunnel for conveying said pieces through said tunnel in a time between 40 and 80 seconds and disturbing the conveyed pieces whereby to expose all exterior surfaces of said meat pieces to said steam.

7. Apparatus as claimed in claim 10 wherein said tunnel is full of super-heated steam.

8. Apparatus as claimed in claim 6 or 7 wherein said means constituting a tunnel includes an entrance means into which said meat pieces are deposited.

9. Apparatus as claimed in claim 8 wherein said entrance means includes a trap door counterbalanced to a closed position when not in use.

10. Apparatus as claimed in claim 6, 7, 8, or 9, wherein said means constituting a tunnel includes an exit means and said exit means includes an exit trap door counterbalanced to a closed position when not in use.

11. Apparatus as claimed in claim 6, 7, 8, 9 or 10, wherein said means constituting a tunnel includes blower and duct means connected to circulate said steam through said tunnel.

12. Apparatus as claimed in claim 11 wherein said duct means includes a duct heater to maintain said circulating super-heated steam at a temperature of 240°F. to 320°F.

13. Apparatus as claimed in claim 6, 7, 8, 9, 10, 11 or 12 wherein said means constituting a tunnel includes heater means positioned about said tunnel to maintain the inner wall surface of said tunnel at a temperature of about 30°F. higher than the circulating steam temperature.

14. Apparatus as claimed in claim 6, 7, 8, 9, 10, 11 12 or 13, wherein said conveying means includes a plurality of wire belts formed and driven in a continuous loop.

15. Apparatus as claimed in claim 14 wherein the end of one belt loop overlaps the end of another belt loop, such that meat pieces are dropped from said one belt onto said other belt to disturb the pieces during conveyance through said tunnel whereby to expose all exterior surfaces of said meat pieces to said steam.

16. A method of treating pieces of meat to reduce microbial counts and improve the storage life thereof, substantially as described with reference to the accompanying drawings.

17. A method of making a fresh pork sausage product having a reduced microbial count and improved shelf life, substantially as described with reference to the accompanying drawings.

18. Meat treatment apparatus, substantially as described with reference to Figures 1A and 1B of the accompanying drawings.

For the Applicants
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Chartered Patent Agent.

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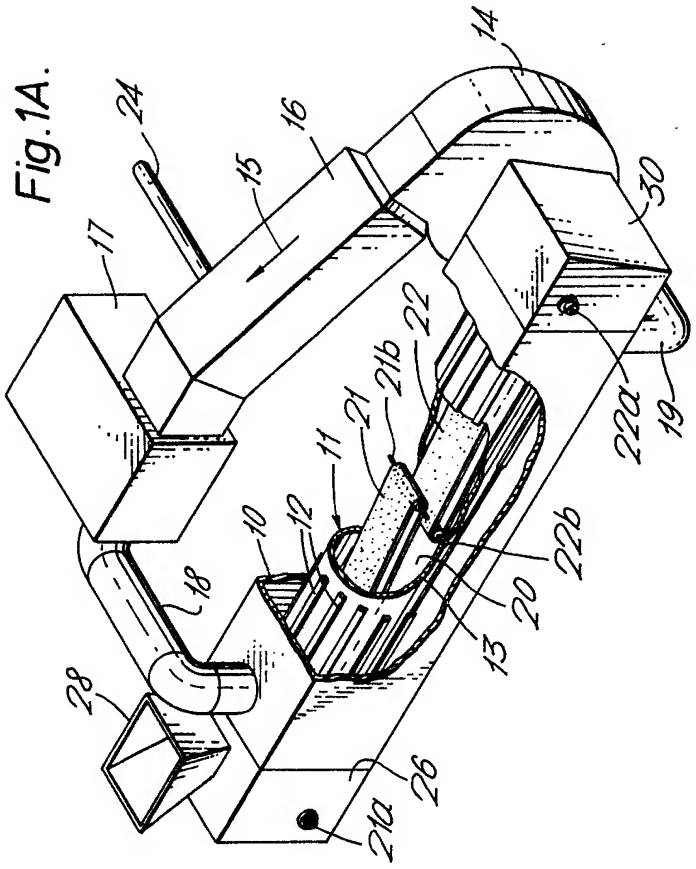
1562590 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

Fig.1A.



1562590 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 2

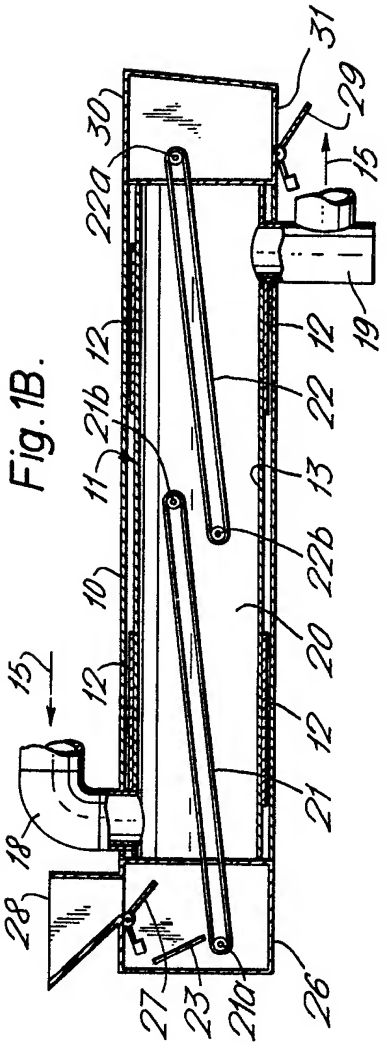


Fig. 1B.

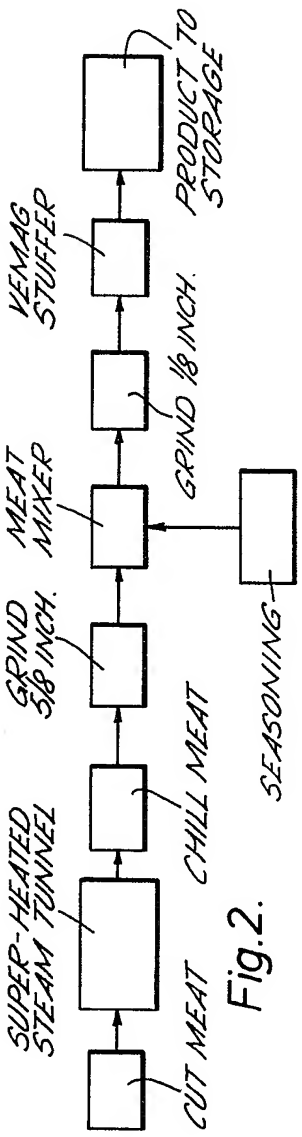


Fig. 2.

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DERWENT-WEEK: 198011

TITLE: Reducing microbial count of pork for sausage mfr. by exposing cuts to superheated steam in closed tunnel

PATENT-ASSIGNEE: DEUT ITT IND GMBH[INTT]

PRIORITY-DATA: 1975US-631541 (November 13, 1975)

PATENT-FAMILY:

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GB 1562590 A	March 12, 1980	EN

APPLICATION-DATA:

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TYPE	IPC DATE
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CIPS	A23B4/005 20060101
CIPS	A23L1/325 20060101

ABSTRACTED-PUB-NO: DE 2651173 A

BASIC-ABSTRACT:

Surfaces of fresh meat pieces and cuts are exposed 40-80 secs. to superheated steam at 115-171 degrees C, inside a sealed tunnel. Position of meat pieces and cuts is changed during steaming, so as to expose all meat surfaces to steam.

Microbe count is reduced to acceptable limits for sausage mfr. Utility and storage-stability of the meat are improved. Aerobic bacteria can be reduced by a factor of 10 and coliform and E. coli can be reduced to <1000/g and 100/g respectively.

TITLE-TERMS: REDUCE MICROBE COUNT PORK SAUSAGE MANUFACTURE EXPOSE CUT SUPERHEAT STEAM CLOSE TUNNEL

DERWENT-CLASS: D12

CPI-CODES: D02-A03;